RESEARCH ARTICLE

# Evaluation of Resistance of Some Iranian Spring Bread Wheat Cultivars to Stem Rust Disease at Seedling Stage

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## ABSTRACT

**Saremirad, A., Bihamta, M. R., Malihipour, A., Mostafavi, Kh., and Alipour, H. 2021.** Evaluation of resistance of some Iranian spring bread wheat cultivars to stem rust disease at seedling stage**. Seed and Plant Journal 36:** 383-401 (in Persian).

This study aimed to evaluate the resistance of 58 spring bread wheat cultivars to stem rust at seedling stage. For this purpose, four races of stem rust pathogen; TTTTF, PTRTF, TTKTK, and TKTTF, which are among the dominant races of stem rust disease in Iran, were used. In all experiments, Morocco and McNair cultivars were included as susceptible controls. Based on the reaction of cultivars, no resistance was observed against all races, and only three cultivars; Adl, Dez, and Ofogh were resistant to three different races of the four races of stem rust pathogen. The results showed that 12 cultivars had resistance against TTTTF and TTKTK, 10 cultivars against PTRTF, and seven cultivars against TKTTF, with reaction on scale of "0" to "2+". Cluster analysis using the Ward's method classified the studied cultivars into five different groups ranging from resistant, moderately-resistant, medium, moderately susceptible, and susceptible reactions for each race. Principal component analysis revealed that cvs. Sivand, Pishtaz, Adl, Niknejad and Ofogh had resistance to TTTTF and PTRTF, and cv. Kaveh showed resistance to TTKTK and TKTTF. Resistance reactions observed in these cultivars may be due to unidentified gene (s) that have not been affected by the pathogen races used in this study. The information about the reaction of spring bread wheat cultivars to stem rust pathogen races at seedling stage can be invaluable for wheat breeders for incorporating stem rust resistance sources in bread wheat breeding programs. Of course, the reaction of spring bread cultivars to stem rust pathogen races at adult plant stage should also be evaluated and considered.

**Keywords**: Spring bread wheat, commercial cultivars, *Puccinia graminis* f. sp. *tritici*, race, resistance genes.

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**Received: 24 August 2020**
**Accepted: 26 January 2021**

RESEARCH ARTICLE

# Growth and Nutrients Uptake in Commercial Pear Cultivars on Seedling, Pyrodwarf® and OH × F69 Rootstocks

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## ABSTRACT

**Esmaili, A., Abdollahi, H., Bazgir, M., and Abdossi, V. 2021.** Growth and nutrients uptake in commercial pear cultivars on seedling, Pyrodwarf® and OH × F69 rootstocks**. Seed and Plant Journal 36:** 403-420 (in Persian).

Pyrodwarf and OH × F69 rootstocks are the main clonal rootstocks for pear trees in Iran. This research was conducted to compare growth and nutrient uptake in different commercial pear cultivars including; Louise Bonne, Dargazi and William`s Duchesse on Pyrodwarf, OH × F69 and Dargazi seedling rootstocks in two years in the nursery. Both clonal rootstocks inducted higher growth in cultivars. Cultivar Louise Bonne had the highest growth on Pyrodwarf rootstock. Calcium content varied from 1.4% to 1.5%, but nitrogen, phosphorus, potassium and manganese showed higher variation, and the highest content of these nutrients were observed in cultivar Dargazi on Pyrodwarf rootstock. The lowest and the highest variations were observed in zinc and iron content, respectively. In addition, about 30% of total iron of the leaves was active iron, indicating high level of active iron in pear in comparison with other fruit tree species. In all graft combinations, variation in micro and macro nutrients contents were in optimum range. Comparison of nutrient contents with active lime level in soil indicated that the range of 10-15% active lime in soil would not hinder growth and nutrients uptake of plants.

**Keywords**: Pear, growth indices, macronutrients, micronutrients, vegetative rootstock.

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**Received: 30 August 2020**
**Accepted: 24 January 2021**

RESEARCH ARTICLE

# Evaluation of Seed Yield Stability of Lentil Genotypes Using GGE Biplot and AMMI Analysis

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## ABSTRACT

**Karimizadeh, R., Pezeshkpour, P., Mirzaei, A., and Sharifi, P. 2021.** Evaluation of seed yield stability of lentil genotypes using GGE biplot and AMMI analysis**. Seed and Plant Journal 36:** 421-438 (in Persian).

In this study, 18 lentil genotypes were grown under rainfed conditions for three growing seasons (2013-2016) in Gachsaran, Ilam and Khorramabad field stations in Iran. Analysis of additive main effects and multiplicative interaction (AMMI) revealed that the effect of environment, genotype and genotype by environment interaction and the first three principal components were significant for seed yield. According to the simultaneous selection indices: ssiASV; G12, G16, G8, G9 genotypes and G2, ssiSIPC: G11, G12, G9, G2 and G7 genotypes, ssiEV; G9, G11, G2, G7 and G15 genotypes, ssiZA; G12, G9, G2, G16 and G7 genotypes, and ssiWAAS; G12, G9, G16, G2 and G8 genotypes were identified as genotypes with yield stability. Polygon view of biplot demonstrated that G2 and G12 genotypes with yield stability. The average tester coordinate (ATC) view of biplot illustrated that G1, G10, G18 and G12 genotypes, in addition to high grain yield, had seed yield stability. G1, G16, G8, G18, G10, G15 and G12 genotypes were desirable based on the ideal genotype view of biplot. The vector view of GGE biplot indicated that the first environment (Gachsaran in 2013-2014) was highly discriminating and representative, and could discriminate the genotypes with yield stability. In conclusion, based on different views of biplot and simultaneous selection indices using AMMI analysis, G12 genotype was identified as superior genotype and can be considered as a candidate for being released as new lentil cultivar for dryland conditions.

**Keywords**: Lentil, discriminating, adaptability, simultaneous selection index, stability indices.

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**Received: 31 August 2020**
**Accepted: 29 December 2020**

RESEARCH ARTICLE

# Effect of Planting Date and Plant Density on Forage Yield and Quality of Quinoa (*Chenopodium quinoa* willd.) Varieties in Cold Temperate Region of Kerman Province in Iran

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## ABSTRACT

**Najafinezhad, H., Shakeri, P., and Amirpour Robat, M. 2021.** Effect of planting date and plant density on forage yield and quality of quinoa (*Chenopodium quinoa* willd.) varieties in cold temperate region of Kerman province in Iran**. Seed and Plant Journal 36:** 439-460 (in Persian).

To evaluate the effect of planting date and plant density on forage yield and quality of four forage quinoa (*Chenopodium quinoa* willd.) varieties, a field experiment was carried out in 2018 and 2019 at the Jupar agricultural and natural resources research station, Kerman, Iran. The experimental design was split factorial arrangements in randomized complete block design with four replications. Experimental treatments consisted of; planting dates at three levels (24 July, 08 August and 23 August) assigned to main plots, and factorial of four varieties (Giza1, Titicaca, Q12 and Q18) and plant density at two levels (16.6 and 33.3 plant $m^{-2}$) were randomized in sub plots. The results showed that var. Q12 had the highest forage yield with 37.4 and 7.62 t $ha^{-1}$ of fresh and dry forage, respectively, and var. Giza1 with 24.9 t ha-1 of fresh forage and 6.39 t $ha^{-1}$ of dry forage had the lowest forage yield. Planting date on 08 August had the highest forage yield with an average of 35.9 and 7.76 t $ha^{-1}$ of fresh and dry forage, respectively. Quality analyses showed that var. Q12 with 18.68% crude protein in forage had significant advantage over other varieties. The lowest neutral detergent fiber (NDF) and acidic detergent fiber (ADF) contents belonged to var. Giza1. Based on the results of this study, var. Q12 can be grown on 08 August with plant density of 33.3 plant $m^{-2}$ as second crop in Jupar region, with cold temperate climate, in Kerman province in Iran.

**Keywords**: Quinoa, temperature, dry forage, crude protein, nutritional value.

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**Received: 25 October 2020**
**Accepted: 26 December 2020**

RESEARCH ARTICLE

# Evaluation of Grain Yield Stability of Bread Wheat (*Triticum aestivum* L.) Promising Lines in Temperate Regions of Iran

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## ABSTRACT

**Bakhtiar, F., Najafian, G., Kaffashi, A. K., Jafarnejad, A., Hassani, F., Zare Feizabadi, A., Amin Azarm, D., Nabati, E., and Abdi, H. 2021.** Evaluation of grain yield stability of bread wheat (*Triticum aestivum* L.) promising lines in temperate regions of Iran. **Seed and Plant Journal 36 (1):** 461-481 (in Persian).

In this study, adaptability and grain yield stability of 18 bread wheat promising lines and two commercial cultivars (Parsi and Baharan) were evaluated using randomized complete blocks design with three replications in 2015-17 cropping seasons in eight experimental stations; Karaj, Kermanshah, Zarghan, Broujerd and Mashhad (under normal irrigation), Neishabour, Isfahan and Varamin (cessation of irrigation at the 50% heading stage), Iran. Combined analysis of variance showed significant genotype × year × location and year × location interaction effects on grain yield. Due to the significant effects of these interactions, the grain yield stability of genotypes as well as genotypes × environments interaction effects were evaluated using non-parametric ranking statistic and AMMI multivariate stability analysis. Mean comparison of grain yield showed that promising lines 16, 12, 10 and 15 had the highest grain yield, respectively. Non-parametric ranking analysis showed that promising lines; 4, 12, 14, 15 and 16 with the lowest ranks and standard deviation of ranks had the highest grain yield stability, respectively. By using biplot graphic of the first two components of AMMI, genotypes 2, 4, 13 and 14 were identified as genotypes with high yield stability, respectively, which also had the least AMMI stability values. Considering grain yield and other agronomic characteristics, promising lines; 14, 15 and 16 that had high grain yield and yield stability and were selected for being released as new commercial cultivars in temperate regions of Iran.

**Key words**: Bread wheat, optimum irrigation, stability parameters, genotype × environment interaction, AMMI stability value.

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**Received: 19 September 2020**
**Accepted: 03 November 2020**

RESEARCH ARTICLE

# Evaluation of Resistance to Leaf Rust (*Puccinia tritic* Eriks.) at Seedling Stage in Wheat Genotypes

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## ABSTRACT

**Delfan, S., Bihamta, M. R., Dadrezaei, S. T., Abbasi, A. R., and Alipour, H. 2021.** Evaluation of resistance to leaf rust (*Puccinia tritic* Eriks.) at seedling stage in wheat genotypes**. Seed and Plant 36:** 483-508 (in Persian).

Leaf rust caused by *Puccinia triticina* Eriks. is the most widespread and regularly occurring rust on wheat. Genetic resistance is the most economical approach of preventing yield losses due to leaf rust. To evaluate the resistance of 320 wheat genotypes at seedling stage to four leaf rust isolates, an experiment was carried out using randomized complete block design with two replications in the greenhouse conditions of the cereal pathology unit of Seed and Plant Improvement Institute in Karaj, Iran. To evaluate the resistance, two components of infection type and latent period, were used. Analysis of variance showed that there was highly significant differences between the genotypes for each of the two components. Dehdasht, Dena, Karaj-2, Khazar-1, Sepahan and Parsi and seven landraces were resistant to all isolates at seedling stage. The correlation between infection type and the latent period was negative and significant. Cluster analysis classified the genotypes into three clusters: susceptible, moderately susceptible to moderately resistant, and resistant to immune. More than 78 percent of the genotypes were in susceptible cluster. Identified resistant genotypes, especially landraces, can be used as sources of resistance to leaf rust in wheat breeding programs.

**Keywords**: Wheat, latent period, infection type, seedling resistance, cluster analysis.

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**Received: 12 September 2020**
**Accepted: 07 December 2020**

RESEARCH SHORT ARTICLE

# Identification of Self-Incompatibility Alleles in Some Japanese Plum (*Prunus salicina* Lindl.) Cultivars and Genotypes Using Polymerase Chain Reaction

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## ABSTRACT

**Pirkhezri, M. 2021.** Identification of self-incompatibility alleles in some Japanese plum (*Prunus salicina* Lindl.) cultivars and genotypes using polymerase chain reaction**. Seed and Plant 36:** 509-526 (in Persian).

Plums are among the most important fruit trees in the world. Japanese plums are diploid and most cultivars are self-incompatibile. Identification of *S*-alleles is necessary for breeding and development programs. In this study, self-incompatibility alleles of 14 cultivars and genotypes of Japanese plum were identified using polymerase chain reaction (PCR) and controlled pollination in orchard. High variation was observed in incompatible alleles using seven pairs of primers of *S-Rnase* and SFB genes. Eighteen bands with sizes of 215 to 1734 bp were amplified with EMPC2consFD & EMPC3consRD primers. Comparing the size of the obtained bands with the size of *S* alleles in NCBI, five bands with new sizes were observed that can be candidated for new alleles, after sequencing. Songorabadi, No.16 and cv. Vaezi had *Sb* allele, which is a self-adaptation factor. By self-compatibility, cv. Vaezi showed 0.79%, Songorabadi 0.21% and No. 16 showed 0.32% self-fertility. The results of self-pollination showed that most of the studied cultivars and genotypes were self-incompatible, but cv. Simka was semi-incompatible with 2.9% self-fertility. The highest average amplified allele in all primers was related to cv. Laroda and cv. Black Amber, and the lowest amplified allele was related to cv. Shiro and cv. Gatreh Tala. Based on the results of this study, molecular techniques in combination with orchard methods can be very effective in identifying self-incompatibility alleles.

**Key words**: Plum, primer, self-pollination, self-compatible, molecular techniques.

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**Received: 05 August 2020**
**Accepted: 16 January 2021**